**Rank of Array**

**What is Rank of Array?**

In computer programming and mathematics, the term "rank" typically refers to the number of dimensions or axes in a multi-dimensional array or tensor. The rank of an array tells you how many indices or subscripts are needed to access an element in that array.

For example:

1. A one-dimensional array is often called a "1D array" or "vector," and it has a rank of 1. You can access elements in a 1D array using a single index.
2. A two-dimensional array is often called a "2D array" or "matrix," and it has a rank of 2. You need two indices (row and column) to access elements in a 2D array.
3. A three-dimensional array is often called a "3D array" and has a rank of 3. You need three indices (for example, x, y, and z) to access elements in a 3D array.

Arrays can have higher ranks as well, with each rank indicating the number of dimensions. In general, you can think of the rank as the number of nested brackets or subscripts needed to access an element in the array.

Here's an example in Python to illustrate arrays of different ranks:

# 1D array (rank 1)

one\_dimensional = [1, 2, 3]

# 2D array (rank 2)

two\_dimensional = [[1, 2, 3], [4, 5, 6]]

# 3D array (rank 3)

three\_dimensional = [[[1, 2], [3, 4]], [[5, 6], [7, 8]]]

In this example, the rank of the arrays corresponds to the number of nested square brackets used to define them. Understanding the rank of an array is important when working with multi-dimensional data, as it helps you determine how many indices are needed to access specific elements in the array.

**What is size of rank in matrix?**

In the context of matrices, the "rank" of a matrix is a measure of its linear independence, and it represents the maximum number of linearly independent rows or columns in the matrix. The rank of a matrix can be thought of as the dimension of the vector space spanned by its rows or columns.

For an m x n matrix:

* The maximum possible rank is min(m, n), which means it cannot exceed the smaller of the number of rows or columns.
* If the rank is less than min(m, n), it indicates that there are linear dependencies between the rows or columns.

For example, a 3x3 matrix can have a maximum rank of 3, but it could have a lower rank if there are linearly dependent rows or columns. The rank is an important concept in linear algebra and has various applications in fields such as engineering, computer science, and statistics.

**How to write the size of vector array?**

The size of a vector or array is typically expressed using the notation of the number of elements it contains. You can write it as follows:

1. For a vector (one-dimensional array): If you have a vector with, for example, 5 elements, you can write its size as "5" or "size = 5."
2. For a two-dimensional array: If you have a 2D array with dimensions, say 3 rows and 4 columns, you can write its size as "3x4" or "3 rows by 4 columns."
3. For a multi-dimensional array: If you have an array with more than two dimensions, you can specify its size by listing the number of elements along each dimension. For example, if you have a 3-dimensional array with dimensions 2x3x4, you can write its size as "2x3x4."

The specific notation may vary depending on the context in which you're working. In programming, you may use specific functions or properties to obtain the size of an array. In mathematical or scientific notations, you can describe the size using the methods mentioned above.

**Is rank 1 array is equal to vector?**

Yes, a rank-1 array is essentially equivalent to a vector in many contexts. In linear algebra, a rank-1 array or a rank-1 matrix is often referred to as a vector.

A rank-1 array (or matrix) is one where all elements are linearly dependent, meaning that one element can be expressed as a scalar multiple of another. In the case of a rank-1 array, it effectively represents a one-dimensional vector space. Therefore, when dealing with rank-1 arrays, you are essentially working with vectors, and they are often referred to as such.

So, in practice, you can think of a rank-1 array as a vector, and the terms are often used interchangeably. The key point is that all elements in a rank-1 array are related by a linear relationship, making it effectively a vector with one direction.